

User manual  
**InviMag® Virus DNA/RNA Mini Kit/ KFmL**  
for use on KingFisher® mL, Thermo Fisher Scientific

for automated purification of viral DNA and RNA from up to 200 µl serum, plasma, cell culture supernatant and other cell-free body fluids, biopsy samples and swabs with magnetic beads



REF 2441150X00



STRATEC Molecular GmbH, D-13125 Berlin

# Instruction InviMag® Virus DNA/RNA Mini Kit/ KFmL

The **InviMag® Virus DNA/RNA Mini Kit/ KFmL** is the ideal tool using a combination of RTP® technology and InviMag® technology for simultaneous isolation of high quality viral DNA and RNA from human and animal serum and plasma samples, cerebrospinal fluid, cell culture supernatants and other cell-free body fluids, like urine as well as from swabs or tissue biopsies for *in vitro* diagnostic purposes. Fresh or frozen plasma or serum from blood treated with anticoagulants like EDTA or citrate, *but not with heparin*. The customer convenient RTP® technology simplifies the process handling, reduces the handling steps with infectious material and allows process monitoring.

Due to the high purity, the isolated viral DNA and RNA is ready-to-use for a broad panel of downstream applications or can be stored at – 80°C for subsequent use.

The kit is neither suitable for isolation of viral DNA or RNA from whole blood or blood stains, nor for isolation of RNA or DNA from bacteria, fungi, plants.



Compliance with EU Directive 98/79/EC on *in vitro* medical devices.

*Not for *in vitro* diagnostic use in countries where the EU Directive 98/79/EC on *in vitro* medical devices is not recognized.*

Trademarks: InviMag®, Invisorb®, RTP®. Registered marks, trademarks, etc. used in this document, even when not specifically marked as such, are not to be considered unprotected by law.

The Invisorb® technology is covered by patents and patent applications: US 6,110363, US 6,043,354, US 6,037,465, EP 0880535, WO 9728171, WO 9534569, EP 0765335, DE 19506887, DE 10041825.2, WO 0034463.

InviMag®, Invisorb® and RTP® are registered trademarks of STRATEC Biomedical AG.

The PCR process is covered by US Patents 4,683,195, and 4,683,202 and foreign equivalents owned by Hoffmann-La Roche AG.

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# Content

<b>Kit contents of InviMag® Virus DNA/RNA Mini Kit/ KFmL</b>	<b>3</b>
<b>Kit contents of InviMag® Virus DNA/RNA Mini Kit/ KFmL/ w/o plastic</b>	<b>4</b>
<b>Symbols</b>	<b>5</b>
<b>Storage</b>	<b>5</b>
<b>Quality control</b>	<b>5</b>
<b>Intended use</b>	<b>6</b>
<b>Product use limitation</b>	<b>6</b>
<b>Internal control (IC) / Extraction control</b>	<b>6</b>
<b>Safety information</b>	<b>7</b>
<b>Product characteristic of the InviMag® Virus DNA/RNA Mini Kit/ KFmL</b>	<b>8</b>
<b>Sampling and storage of starting material</b>	<b>8</b>
<b>Principle and procedure</b>	<b>9</b>
<b>Yield and quality of viral DNA and / or viral RNA</b>	<b>10</b>
<b>Important notes</b>	<b>10</b>
<b>Reagents and equipment to be supplied by user</b>	<b>10</b>
<b>Preparing reagents and buffers</b>	<b>11</b>
<b>Important indications</b>	<b>11</b>
<b>Scheme of the InviMag® Virus DNA/RNA Mini Kit/ KFmL</b>	<b>12</b>
<i>Protocol 1:</i> Simultaneous isolation of total nucleic acids (viral DNA and RNA) from cell free body fluids (serum, plasma, CSF, synovial, urine)	13
<i>Protocol 2:</i> Simultaneous isolation of total nucleic acids (viral DNA and RNA) from cell culture supernatant	13
<i>Protocol 3:</i> Simultaneous isolation of total nucleic acids (viral DNA and RNA) from swabs or 200 µl rinse liquid	14
<i>Protocol 4 :</i> Simultaneous isolation of total nucleic acids (viral DNA and RNA) from tissue biopsy	14
<b>Starting a run on the KFmL instrument</b>	<b>15</b>
<b>The following steps will run automatically on the KingFisher mL</b>	<b>16</b>
<b>For self-programming of the KingFisher mL system</b>	<b>17</b>
<b>Troubleshooting</b>	<b>19</b>
<b>Appendix</b>	<b>20</b>
<b>General notes on handling DNA</b>	<b>21</b>
<b>General notes on handling viral RNA</b>	<b>22</b>
<b>Ordering information</b>	<b>23</b>

## Kit contents of InviMag® Virus DNA/RNA Mini Kit/ KFmL

Store the **MAP Solution A** at 2-8°C.

Store all other kit components at room temperature.

	<b>15 extractions</b>	<b>75 extractions</b>	<b>300 extractions</b>
<b>Catalogue No.</b>	2441150100	2441150200	2441150400
<b>Extraction Tubes</b>	15	75	6 x 50
<b>MAP Solution A</b>	0.5 ml	2 x 1 ml	7 ml
<b>Binding Solution</b> (fill with 99.7% Isopropanol)	empty bottle (final volume 8 ml)	empty bottle (final volume 40 ml)	empty bottle (final volume 140 ml)
<b>Wash Buffer R1</b>	10 ml (final volume 20 ml)	2 x 20 ml (final volume 2 x 40 ml)	2 x 80 ml (final volume 2 x 160 ml)
<b>Wash Buffer R2</b>	12 ml (final volume 60 ml)	30 ml (final volume 150 ml)	3 x 40 ml (final volume 3 x 200 ml)
<b>Elution Buffer R</b>	2 ml	15 ml	60 ml
<b>KingFisher mL Tip Combs</b>	3	15	60
<b>KingFisher mL Tube Strips</b>	15	5 x 15	300
<b>Elution Tubes</b>	15	5 x 15	6 x 50
<b>Manual</b>	1	1	1
<b>Initial steps</b>	Fill 8 ml 99.7% <b>Isopropanol</b> (molecular biologic grade) into the empty bottle  Add 10 ml of 96-100% ethanol to the bottle <b>Wash Buffer R1</b> , mix thoroughly and always keep the bottle firmly closed!  Add 48 ml of 96-100% ethanol to the bottle <b>Wash Buffer R2</b> , mix thoroughly and always keep the bottle firmly closed!	Fill 40 ml 99.7% <b>Isopropanol</b> (molecular biologic grade) into the empty bottle  Add 20 ml of 96-100% ethanol to the bottle <b>Wash Buffer R1</b> , mix thoroughly and always keep the bottle firmly closed!  Add 120 ml of 96-100% ethanol to the bottle <b>Wash Buffer R2</b> , mix thoroughly and always keep the bottle firmly closed!	Fill 140 ml 99.7% <b>Isopropanol</b> (molecular biologic grade) into the empty bottle  Add 80 ml of 96-100% ethanol to each bottle <b>Wash Buffer R1</b> , mix thoroughly and always keep the bottle firmly closed!  Add 160 ml of 96-100% ethanol to each bottle <b>Wash Buffer R2</b> , mix thoroughly and always keep the bottle firmly closed!

## Kit contents of InviMag® Virus DNA/RNA Mini Kit/ KFmL w/o plastic

Store the **MAP Solution A** at 2-8°C.

Store all other kit components at room temperature.

	<b>15 extractions</b>	<b>75 extractions</b>	<b>300 extractions</b>
<b>Catalogue No.</b>	2441150150	2441150250	2441150450
<b>Extraction Tubes</b>	15	75	6 x 50
<b>MAP Solution A</b>	0.5 ml	2 x 1 ml	7 ml
<b>Binding Solution</b> (fill with 98-100% Isopropanol)	empty bottle (final volume 8 ml)	empty bottle (final volume 40 ml)	empty bottle (final volume 140 ml)
<b>Wash Buffer R1</b>	10 ml (final volume 20 ml)	2 x 20 ml (final volume 2 x 40 ml)	2 x 80 ml (final volume 2 x 160 ml)
<b>Wash Buffer R2</b>	12 ml (final volume 60 ml)	30 ml (final volume 150 ml)	3 x 40 ml (final volume 3 x 200 ml)
<b>Elution Buffer R</b>	2 ml	15 ml	60 ml
<b>Elution Tubes</b>	15	5 x 15	6 x 50
<b>Manual</b>	1	1	1
<b>Initial steps</b>	Fill 8 ml 99.7% <b>Isopropanol</b> (molecular biologic grade) into the empty bottle  Add 10 ml of 96-100% ethanol to the bottle <b>Wash Buffer R1</b> , mix thoroughly and always keep the bottle firmly closed!  Add 48 ml of 96-100% ethanol to the bottle <b>Wash Buffer R2</b> , mix thoroughly and always keep the bottle firmly closed!	Fill 40 ml 99.7% <b>Isopropanol</b> (molecular biologic grade) into the empty bottle  Add 20 ml of 96-100% ethanol to the bottle <b>Wash Buffer R1</b> , mix thoroughly and always keep the bottle firmly closed!  Add 120 ml of 96-100% ethanol to the bottle <b>Wash Buffer R2</b> , mix thoroughly and always keep the bottle firmly closed!	Fill 140 ml 99.7% <b>Isopropanol</b> (molecular biologic grade) into the empty bottle  Add 80 ml of 96-100% ethanol to each bottle <b>Wash Buffer R1</b> , mix thoroughly and always keep the bottle firmly closed!  Add 160 ml of 96-100% ethanol to each bottle <b>Wash Buffer R2</b> , mix thoroughly and always keep the bottle firmly closed!
<b>Plastic to be supplied by user</b> (see order information)			
<b>KingFisher mL Tip Combs</b>	3	15	60
<b>KingFisher mL Tube Strips</b>	15	5 x 15	300

## Symbols

	Lot number
	Catalogue number
	Expiry date
	Consult operating instructions
	Temperature limitation
	Do not reuse

## Storage

All buffers and kit contents of the **InviMag® Virus DNA/RNA Mini Kit/ KFmL**, except **MAP Solution A**, are stable for at least 12 months. **MAP Solution A** is stable for at least 6 months.

All buffers and kit contents of the **InviMag® Virus DNA/RNA Mini Kit/ KFmL**, except **MAP Solution A**, should be stored at room temperature (RT)

**MAP Solution A:** should be stored at 2-8°C.

**Room temperature is defined as range from 15–30°C.**

**Wash Buffer** charged with ethanol should be stored at room temperature and should be appropriate sealed. If there are any precipitates visible within the provided solutions dissolve them by carefully warming up to 30°C.

## Quality control and product warranty

STRATEC Molecular warrants the correct function of the **InviMag® Virus DNA/RNA Mini Kit/ KFmL** for applications as described in this manual. Purchaser must determine the suitability of the product for its particular use. Should any product fail to perform the applications as described in the manual, STRATEC Molecular will check the lot and if STRATEC Molecular investigates a problem in the lot, STRATEC Molecular will replace the product free of charge.

STRATEC Molecular reserves the right to change, alter, or modify any product to enhance its performance and design at any time.

In accordance with STRATEC Molecular's ISO 9001-2000 and ISO EN 13485 certified Quality Management System the performance of all components of the **InviMag® Virus DNA/RNA Mini Kit/ KFmL** have been tested separately against predetermined specifications routinely on lot-to-lot to ensure consistent product quality.

If you have any questions or problems regarding any aspects of **InviMag® Virus DNA/RNA Mini Kit/ KFmL** or other STRATEC Molecular products, please do not hesitate to contact us. A copy of STRATEC Molecular's terms and conditions can be obtained upon request or are presented at the STRATEC Molecular webpage.

**For technical support or further information please contact:**

**from Germany: +49-(0)30-9489-2901/ 2910**

**from abroad: +49-(0)30-9489-2907**

**or contact your local distributor.**

## Intended use

The **InviMag® Virus DNA/RNA Mini Kit/ KFmL** is designed for a simultaneous rapid and economical preparation of DNA and RNA from viruses from a wide range of clinical samples, using **RTP®-technology**, magnetic beads, and the KingFisher mL workstation.

The whole process is based on a patented technology, the **InviMag® technology**, for isolation of viral DNA and RNA by binding the nucleic acid onto magnetic particles without chaotropic buffer components.

For reproducible and high yields appropriate sample storage is essential. The purified DNA / RNA is of high quality and can be used for *in vitro* diagnostic analysis.

THE PRODUCT IS INDENTED FOR USE BY PROFESSIONALS ONLY, SUCH AS TECHNICIANS, PHYSICIANS AND BIOLOGISTS TRAINED IN MOLECULAR BIOLOGICAL TECHNIQUES. It is designed to be used with any downstream application employing enzymatic amplification or other enzymatic modifications of DNA/ RNA followed by signal detection or amplification. Any diagnostic results generated by using the sample preparation procedure in conjunction with any downstream diagnostic assay should be interpreted with regard to other clinical or laboratory findings.

To minimize irregularities in diagnostic results, adequate controls for downstream applications should be used.

*The kit is in compliance with EU Directive 98/79/EC on in vitro medical devices. But it is not for in vitro diagnostic use in countries where the EU Directive 98/79/EC on in vitro medical devices is not recognized.*

## Product use limitation

The kit is neither validated for the isolation of genomic DNA from stool sample, dried blood stains, nor from bacteria, fungi, parasites or the purification of total RNA.

The included chemicals are only useable once.

Differing of starting material or flow trace may lead to inoperability; therefore neither a warranty nor guarantee in this case will be given, neither implied nor express.

The user is responsible to validate the performance of the STRATEC Molecular product for any particular use. STRATEC Molecular does not provide for validation of performance characteristics of the product with respect to specific applications. STRATEC Molecular products may be used e.g. in clinical diagnostic laboratory systems conditioned upon the complete diagnostic system of the laboratory the laboratory has been validated pursuant to CLIA' 88 regulations in the U.S. or equivalents in other countries.

All products sold by STRATEC Molecular are subject to extensive quality control procedures (according to ISO 9001-2000 and ISO EN 13485) and are warranted to perform as described herein. Any problems, incidents or defects shall be reported to STRATEC Molecular immediately upon detection thereof.

The chemicals and the plastic parts are for laboratory use only; they must be stored in the laboratory and must not be used for purposes other than intended.

The product with its contents is unfit for consumption.

## Internal control (IC) / Extraction control

Internal Controls (IC) from the PCR assay provider can be used as extraction controls if the fragments are longer than 100 bp. In this case they have to be added after finalization of the lysis step.

Attention: don't add directly these Internal Controls to the sample!

## Safety information

When and while working with chemicals, always wear a suitable lab coat, disposable gloves, and protective goggles!

Avoid skin contact! Adhere to the legal requirements for working with biological material!

For more information, please consult the appropriate material safety data sheets (MSDS). These are available online in convenient and compact PDF format at [www.stratec.com](http://www.stratec.com) for each STRATEC Molecular product and its components. If buffer bottles are damaged or leaking, WEAR GLOVES, AND PROTECTIVE GOGGLES when discarding the bottles in order to avoid any injuries.

STRATEC Molecular has not tested the liquid waste generated by the **InviMag® Virus DNA/RNA Mini Kit/ KFmL** procedures for residual infectious materials. Contamination of the liquid waste with residual infectious materials is highly unlikely, but cannot be excluded completely. Therefore, liquid waste must be considered infectious and be handled and discarded according to local safety regulations.

European Community risk and safety phrases for the components of the **InviMag® Virus DNA/RNA Mini Kit/ KFmL** to which they apply, are listed below as follows:

**Wash Buffer R1** contains guanidinthiocyanat which is an irritant. Wash Buffer and Elution Buffer R contain DEPC-treated ddH<sub>2</sub>O. DEPC is inactivated by autoclaving for 20 min. at 121°C.

### Proteinase K (included in the Extraction Tube )



danger

H315-319-334-335 P280-305-351-338-310-405

### Wash Buffer R1



danger

H302-312-332-412 EUH032 P273

H319:

Causes serious eye irritation.

H302:

Harmful if swallowed.

H312:

Harmful in contact with skin.

H332:

Harmful if inhaled.

H412:

Harmful to aquatic life with long lasting effects.

EUH032:

Contact with acids liberates very toxic gas.

H315:

Causes skin irritation.

H334:

May cause allergy or asthma symptoms or breathing difficulties if inhaled.

H335:

May cause respiratory irritation.

P305+P351+P338:

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P273:

Avoid release to the environment.

P280:

Wear protective gloves/protective clothing/eye protection/face protection.

P310:

Immediately call a POISON CENTER or doctor/physician.

P405:

Store locked up.

**Emergency medical information can be obtained 24 hours a day from infotrac:**

**outside of USA:**      **1 – 352 – 323 – 3500**

**in USA :**                **1 – 800 – 535 – 5053**

## Product characteristic of the InviMag® Virus DNA/RNA Mini Kit/ KFmL

Starting material	Yield	Time for preparation
up to 200µl of fresh or frozen plasma, serum and cell free body fluids	sensitive recovery realizing amplification with sensitive detection assays from starting material including minimum 100 copies per ml	about 20-25 min after lysis
up to 200 µl cell culture supernatant		
up to 200µl of rinse liquid from swabs swab		
up to 10 mg biopsy samples		

The **InviMag® Virus DNA/RNA Mini Kit/ KFmL** is designed for a simultaneous rapid and economical preparation of viral DNA and RNA from a wide range of clinical samples, using a combination of RTP®-technology, magnetic beads, and the KingFisher mL workstation.

The isolation process is based on a patented technology, the InviMag® technology, for isolation of viral RNA and DNA by binding the nucleic acid onto magnetic particles without chaotropic buffer components.

The sample is lysed in an optimized lysis buffer. The lysates are transferred to the subsequent automatic purification procedure based on magnetic beads. The viral DNA and RNA bind to magnetic particles, followed by washing steps and a final elution. The procedure requires only minimal interaction by the user, allowing safe handling of potentially infectious samples. The procedure is designed to avoid sample-to-sample cross-contamination.

The purified high quality viral DNA and RNA is ready-to-use for subsequent downstream applications (see below) or can be stored at -20°C for subsequent use.

- RT-PCR\*
- PCR\*
- Real-time PCR for quantitative and qualitative virus diagnostic

No toxic or hazardous chemicals like chaotropic components are used.

For the isolation of viral RNA from single sample from 200 µl starting material STRATEC Molecular offers the **RTP® DNA/RNA Virus Mini Kit** and the **Invisorb® Spin Virus RNA Mini Kit**.

For the isolation of viral RNA using magnetic particle in high throughput format, STRATEC Molecular offers the **InviMag® Virus Kits/KF96** for use on a KingFisher 96 robot. For vacuum or centrifuge based isolation of viral RNA in 96 well format on different robotic stations STRATEC Molecular offers the **Invisorb® DNA Virus HTS 96 Kit** and the **Invisorb® RNA Virus HTS 96 Kit**. (See ordering information, page 21)

For further information please contact: +49 (0) 30 9489 2901, 2910 in Germany and from foreign countries: +49 (0) 30 9489 2907 or call your local distributor

## Sampling and storage of starting material

Best results are obtained using freshly extracted samples. As long as the samples are not shock frosted with liquid nitrogen or are incubated with RNase inhibitors or denaturing reagents, the viral RNA is not secured. Therefore it is essential, that samples are immediately flash frozen subsequent to the harvesting by using liquid nitrogen and are stored at -80°C. Viral RNA contained in such deep frozen samples is stable for months. Viral RNA purification should be processed as soon as possible. Samples can also be stored in the dissolved Lysis Buffer in the Extraction Tube I or II for 1 h at room temperature, overnight at 4°C, and for long-term storage at -80°C. Storage under deep frozen conditions is recommended.

Serum, plasma, urine, cerebrospinal fluid or other cell-free body fluids, as well as cell culture supernatants, swabs, and stool samples can be stored on ice for 1-2 hours, for short time (up to 24 h) samples may be stored at -20°C. For long-term storage, we recommend freezing samples at -80°C. Multiple thawing and freezing cycles before isolating the viral RNA should be avoided.

### **Serum and plasma (and other cell free body fluids)**

Following centrifugation, plasma or serum from blood treated with anticoagulants like EDTA or citrate, *but not with heparin*, can be stored at 2-8°C for up to 6 hours. For long-term storage, freezing at -20°C to -80°C in aliquots is recommended. Repeated freezing and thawing cycles must be avoided because denaturation and precipitation of proteins result in a decrease of the virus titer and thereby reduce the yield of the extracted viral RNA. Occurring cryoprecipitates can be pelleted by briefly centrifuging (6.800 x g for 3 min). The cleared supernatant should be removed, without disturbing the pellet, and processed immediately. This step will not reduce viral titers.

\* The PCR process is covered by US Patents 4,683,195, and 4,683,202 and foreign equivalents owned by Hoffmann-La Roche AG.

### **Tissue samples (biopsy material or frozen section)**

Best results are obtained with fresh material or material that has been immediately flash frozen and stored at -20°C or -80°C. Repeated freezing and thawing cycles of stored samples should be avoided because this leads to a low RNA yield. Use of poor quality starting material influences the RNA yield, too. The amount of purified RNA in the **RTP® DNA/ RNA Virus Mini Kits** procedure using up to 20 mg tissue sample, depends on kind of starting material. The thawing process could be proceed, e.g. directly in the **Extraction Tubes**.

### **Cell culture supernatants**

Best results are obtained with fresh material or material that has been immediately frozen and stored at -20°C or -80°C after separation of the cell culture supernatant. Repeated freezing and thawing cycles of stored samples will influence the sensitivity.

### **Swabs**

The protocol works with fresh prepared swabs or rinsed liquid from swabs or mouth brushes. Best results are obtained with fresh material or material that has been immediately frozen and stored at -20°C or -80°C.

STRATEC Molecular will be released of its responsibilities if other sample materials than described in the Intended Use are processed or if the sample preparation protocols are changed or modified.

## **Principle and procedure**

The **InviMag® Virus DNA/RNA Kit/ KFmL** procedure comprises following steps:

- lysis of the virus particles in the prefilled Extraction Tube
- binding the viral NA to the magnetic beads
- washing of the magnetic beads and elimination of ethanol
- elution of the viral nucleic acids

After lysis, the viral NA bind to the magnetic beads, contaminations and enzyme inhibitors are efficiently removed during the following three wash steps and high purified DNA/RNA is eluted in Elution Buffer R or water.

This manual contains 4 protocols.

### **Lysis**

Samples are lysed under denaturing conditions at elevated temperatures.

### **Binding of the viral nucleic acids**

After adding **Binding Solution** and **MAP Solution A** to the lysate in the **Extraction Tube**, the nucleic acids are bound to the surface of the magnetic beads.

### **Removing residual contaminants**

Contaminants are efficiently washed away using **Wash Buffer R1** and **R2**, while the nucleic acids remain bound to the magnetic beads

### **Elution**

The nucleic acids are eluted from the beads using 100 µl **Elution Buffer R**.

The eluted nucleic acids are ready-to-use in different subsequent tests.

## **Yield and quality of viral DNA and / or viral RNA**

Different amplification systems vary in efficiency depending on the total amount of nucleic acid present in the reaction.

Eluates derived by this kit will contain Carrier-RNA, which will greatly exceed the amount of the isolated NA.

Yields of viral nucleic acids isolated from biological samples are usually low concentrated and therefore almost impossible to determine photometrically.\*

\* Keep in mind that the Carrier-RNA (5 µg per 200 µl sample) will account for most of the present NA.

The kit is suitable for downstream analysis with NAT techniques, for examples qPCR, RT qPCR, LAMP, LCR. Diagnostic assays should be performed according to the manufacturer's instructions. The amount of purified viral NA in the **InviMag® Virus DNA/RNA Mini Kit/ KFmL** procedure from plasma etc., depends on the sample type, sample source, transport, storage, and age. Quantitative RT-PCR is recommended for determination of viral NA yield.

*\* In Gel Electrophoresis and in Capillary Electrophoresis, RNA extracted with the provided kit looks like degraded cause the kit contains Carrier-RNA, this is poly A RNA in fragments of 100 up to 1000 bases. The kit is not dedicated for applications using this kind of analysis.*

## **Important notes**

### **Important points before starting a protocol**

Immediately upon receipt of the product, inspect the product and its components as well as the package for any apparent damages, correct quantities and quality. If there are any unconformities you have to notify STRATEC Molecular in writing with immediate effect upon inspection thereof. If buffer bottles are damaged, contact the STRATEC Molecular Technical Services or your local distributor. In case of liquid spillage, refer to "Safety Information" (see page 7). Do not use damaged kit components, since their use may lead to poor kit performance.

- Always change pipet tips between liquid transfers. To avoid cross-contamination, we recommend the use of aerosol-barrier pipet tips.
- All centrifugation steps are carried out at room temperature.
- When working with chemicals, always wear a suitable lab coat, disposable gloves and protective goggles.
- Discard contaminated gloves immediately.
- Do not combine components of different kit, unless the lot numbers are identical.
- Avoid microbial contamination of the kit reagents.
- To minimize the risk of infections from potentially infectious material, we recommend working under laminar air-flow until the samples are lysed.
- This kit should only be used by trained personnel.

## **Reagents and equipment to be supplied by user**

- Measuring cylinder (250 ml)
- Pipette and pipette tips
- Disposable gloves
- Reaction tubes (1.5 ml or 2.0 ml)
- ddH<sub>2</sub>O
- Vortexer
- 96–100% ethanol
- Isopropanol \*

The **InviMag® Virus DNA/RNA Mini Kit/ KFmL** is validated with 2-Propanol; Rotipuran >99.7%, p.a., ACS, ISO (Order no. 6752) from **Carl Roth**

\* Possible suppliers for Isopropanol:

**Carl Roth**

2-Propanol  
Rotipuran >99.7%, p.a., ACS, ISO  
Order no. 6752

**Applichem**

2-Propanol für die Molekularbiologie  
Order no. A3928

**Sigma**

2-Propanol  
Order no. 59304-1L-F

## Preparing reagents and buffers

### 15 viral NA-extractions:

Fill 8 ml 99.7% **Isopropanol** (molecular biologic grade) into the empty bottle  
Add 10 ml of 96-100% ethanol to the bottle Wash Buffer R1, mix thoroughly and keep the bottle always firmly closed  
Add 48 ml of 96-100% ethanol to the bottle Wash Buffer R2, mix thoroughly and always keep the bottle firmly closed!

### 75 viral NA-extractions:

Fill 40 ml 99.7% **Isopropanol** (molecular biologic grade) into the empty bottle  
Add 20 ml of 96-100% ethanol to each bottle Wash Buffer R1, mix thoroughly and keep the bottle always firmly closed  
Add 120 ml of 96-100% ethanol to the bottle Wash Buffer R2, mix thoroughly and always keep the bottle firmly closed!

### 300 viral NA-extractions:

Fill 120 ml 99.7% **Isopropanol** (molecular biologic grade) into the empty bottle  
Add 80 ml of 96-100% ethanol to each bottle Wash Buffer R1, mix thoroughly and keep the bottle always firmly closed  
Add 140 ml of 96-100% ethanol to each bottle Wash Buffer R2, mix thoroughly and always keep the bottle firmly closed!

## Important indications

### Preparing viral RNA

When preparing viral RNA, work quickly during the manual steps of the procedure.

The Lysis Buffer in the Extraction Tube simplifies viral RNA isolation by combining efficient lysis of the starting material and the inactivation of exogenous and endogenous RNases. Special care should be taken to avoid contaminations with RNases when handling Elution Buffer R.

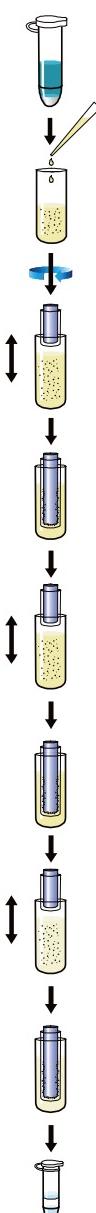
### Storing samples

Frozen serum or plasma samples must not be thawed more than once. Repeated freezing and thawing cycles leads to denaturation and precipitation of proteins, resulting in reduced viral titers and therefore reduced yields of viral nucleic acids.

### Carrier-RNA

Carrier-RNA serves two purposes: It enhances the binding of viral acids to the beads, especially if there are only very few target molecules in the sample. Furthermore, the addition of large amounts of Carrier-RNA reduces the chance of viral nucleic acid degradation in the rare event that RNase or DNase molecules are not denatured by the salts and detergents in the Lysis Buffer in the Extraction Tube.

## Scheme of the InviMag® Virus DNA/RNA Kit/ KFmL

	<b><i>Please read protocols prior the start of the preparation carefully</i></b>
	Add required amount of ddH <sub>2</sub> O (200-400 µl) to the sample. Vortex for 10 s. Place sample into a Thermomixer and incubate while continuously shaking for 15 min at 65°C, followed by an incubation for 10 min at 95°C.
	During lysis, prefill all KingFisher Tube strips with required buffers and appropriate volumes  Tube A: 400 µl <b>Binding Solution</b> and 20 µl <b>MAP Solution A</b> Tube B: 800 µl <b>Wash Buffer R1</b> Tube C: 800 µl <b>Wash Buffer R2</b> Tube D: 800 µl <b>Wash Buffer R2</b> Tube E: 100 µl <b>Elution Buffer R</b>  Add approx. 450 µl of the lysed sample to Tube A
	Viral NA binding to magnetic particle
	Magnetic separation
	Washing of the particle fixed viral NA
	Magnetic separation
	Elution of genomic DNA
	Magnetic Separation
	Pure viral NA

## **Protocol 1: Simultaneous isolation of total nucleic acids (viral DNA and RNA) from cell free body fluids (serum, plasma, CSF, synovial, urine)**

**Please read the instructions carefully and conduct the prepared procedure.**

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### **Sample Lysis**

1. Transfer 200 µl of the sample into the **Extraction Tube** and add 200 µl of ddH<sub>2</sub>O. Close the cap and mix by vortexing for 10 s.
2. Place the **Extraction Tube** into a Thermomixer and incubate while continuously shaking for 15 min at 65°C. During lysis, prefill all tubes with the required buffers and appropriate volumes (see page 17).
3. Place the Extraction Tube into another Thermomixer and incubate under continuously shaking for 10 minutes at 95°C.  
(These step leads to higher sensitivity for some viruses or some strains of viruses e.g. HIV or HCV)
4. After lysis, transfer the lysed sample into the Tube A of the KingFisher tube strip and add the 400 µl of **Binding Solution** and 20 µl **MAP Solution A**.

**Note: Vortex the tube MAP Solution A vigorously before use!**

5. Start the assay file (see page 17).
- 

## **Protocol 2: Simultaneous isolation of total nucleic acids (viral DNA and RNA) from cell culture supernatant**

**Please read the instructions carefully and conduct the prepared procedure.**

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### **Sample Lysis**

1. Transfer 200 µl of the cell free cell culture supernatant (cell culture media) into the **Extraction Tube** and add 200 µl of ddH<sub>2</sub>O. Close the cap and mix by vortexing for 10 s.
2. Place the **Extraction Tube** into a Thermomixer and incubate while continuously shaking for 15 min. at 65°C. During lysis, prefill all tubes with the required buffers and appropriate volumes (see page 17).
3. Place the Extraction Tube into another Thermomixer and incubate under continuously shaking for 10 min at 95°C.  
(These step leads to higher sensitivity for some viruses or some strains of viruses e.g. HIV or HCV.)
4. After lysis, transfer the lysed sample into the Tube A of the KingFisher tube strip and add the 400 µl of **Binding Solution** and 20 µl **MAP Solution A** (see also below).

**Note: Vortex the tube MAP Solution A vigorously before use!**

5. Start the program, see instructions on page 17.

## **Protocol 3: Simultaneous isolation of total nucleic acids (viral DNA and RNA) from swabs or 200 µl rinse liquid**

**Please read the instructions carefully and conduct the prepared procedure**

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### **Sample Lysis**

- 1a. Place the swab into the **Extraction Tube** and add 400 µl of ddH<sub>2</sub>O. Close the cap and mix by vortexing for 10 s.
- 1b. Transfer 200 µl of rinse liquid or of the stabilization media into the **Extraction Tube** and add 200 µl of ddH<sub>2</sub>O. Close the cap and mix by vortexing for 10 s.
2. Place the **Extraction Tube** into a Thermomixer and incubate while continuously shaking for 15 min. at 65°C. During lysis, prefill all tubes with the required buffers and appropriate volumes (see page 17).
3. Place the Extraction Tube into another Thermomixer and incubate under continuously shaking for 10 min at 95°C.  
(These step leads to higher sensitivity for some viruses or some strains of viruses e.g. HIV or HCV.)
4. After lysis, transfer the lysed sample into the Tube A of the KingFisher tube strip and add the 400 µl of **Binding Solution** and 20 µl **MAP Solution A** (see also below).

**Note: Vortex the tube MAP Solution A vigorously before use!**

5. Start the program, see instructions on page 17.

**Important Note:** *To get maximum yield of viral nucleic acids it is essential to leave the swab during the complete lysis time into the reaction tube. It is possible to cut the shaft of the swab, so that you can close the cap of the Extraction Tube. It is also possible to do the lysis step with opened cap. The removing of the swab from the Extraction Tube ahead of time will be lead to a dramatically reduced final yield! After lysis time carefully squeeze out the swab on the wall of the tube and discard the swab.*

## **Protocol 4 : Simultaneous isolation of total nucleic acids (viral DNA and RNA) from tissue biopsy**

**Please read the instructions carefully and conduct the prepared procedure**

---

### **Sample Lysis**

- 1a. Transfer 1 mg – 10 mg of the tissue biopsy into the **Extraction Tube**. Add 400 µl of ddH<sub>2</sub>O. Close the cap and mix by vortexing for 10 s.
2. Place the **Extraction Tube** into a Thermomixer and incubate while continuously shaking for 15 min. at 65°C. Lysis time can be increased for up to 30 min. After a prolonged lysis a reduced yield and quality of some viral RNA species may occur.  
After lysis, centrifuge the sample at max. speed for 1 min to spin down unlysed material and follow exactly the next step.  
During lysis, prefill all tubes with the required buffers and appropriate volumes (see page 17).
3. Place the Extraction Tube into an other thermomixer and incubate while continuously shaking for 10 min. at 95°C.  
(These step leads to higher sensitivity for some viruses or some strains of viruses e.g. HIV or HCV.)
4. After lysis, transfer the lysed sample into the Tube A of the KingFisher tube strip and add the 400 µl of **Binding Solution** and 20 µl **MAP Solution A**.

**Note: Vortex the tube MAP Solution A vigorously before use!**

5. Start the program, see instructions on page 17.

## Starting a run on the KFmL instrument

1. During lysis, prefill the tubes of the KingFisher tube strips with the required buffers and appropriate volumes.

### KingFisher mL Tube Strip Setup

Tube A: Filled with app. 450 µl of the lysed sample, 400 µl **Binding Solution** and 20 µl **MAP Solution A** after finishing the lysis step.

**It is important to mix the bottle with MAP Solution A by vigorously shaking or vortexing!**

Tube B: 800 µl **Wash Buffer R1**

Tube C: 800 µl **Wash Buffer R2**

Tube D: 800 µl **Wash Buffer R2**

Tube E: 100 µl **Elution Buffer R**

2. Insert the prefilled KingFisher tube strips into the KingFisher instrument
3. Place the KingFisher tips onto the magnetic rack!

After these preliminary steps start the assay file “**InviMag Virus DNA-RNA KFmL**”

### **Important Notes:**

*After finishing the extraction protocol, the Tube E contains the extracted RNA / DNA.  
Store the RNA / DNA under adequate conditions.*

*We recommend transferring the extracted viral RNA / DNA into 1.5 ml reaction tubes store the DNA / RNA at -20°C or -80°C (recommended for RNA).*

*If the viral RNA / DNA contains carryover of magnetic particles , transfer the viral NA into a 1.5 ml reaction tube and centrifuge at maximum speed for 1 minute. Transfer the viral RNA / DNA containing supernatant into a new tube.*

## **The following steps will run automatically on the KingFisher mL**

### **1. Binding of the DNA/RNA**

Automatically sample mixing for 5 min. MAP separation. Moving of the MAP with bounded nucleic acids into the Tube B.

### **2. First Washing**

Automatically sample mixing for 1 min. MAP separation. Moving of the MAP with bounded nucleic acids into the Tube C.

### **3. Second Washing**

Automatically sample mixing for 1 min. MAP separation. Moving of the MAP with bounded nucleic acids into the Tube D.

### **4. Third Washing and Drying**

Automatically sample mixing for 1 min. MAP separation. Drying the MAP with bounded nucleic acids outside of the Tube for 8 min. Moving of the MAP into the E wells.

### **5. Elution of the viral DNA and / or RNA**

Incubation of the MAP into the Tube E for 10 min by mixing. MAP separation.

The MAP will than automatically removed into the B wells (disposal).

The extracted viral DNA/RNA can now be transferred into 1.5 ml reaction tubes.

**Optional:** *Carryover of magnetic particles should be removed by centrifugation at max. speed for 1 min. Transfer the clear supernatant into a new 1.5 ml reaction tube.*

**Note:** *The eluate contains viral DNA and/or RNA. After extraction place the elution tube on ice. For a long-term freeze the nucleic acids at -20°C or -80°C (recommended for RNA).*

# For self programming of the KingFisher mL system

## [Protocol Properties]

Name = InviMag Virus DNA\_RNA KFmL  
Protocol template version = 3.1  
Instrument type = KF96 / KFflex96  
Kit name = InviMag Virus DNA-RNA Kit/ KF96/  
KFflex96  
Description = KF96 / KFflex96 protocol for  
Isolation of genomic DNA, viral DNA or RNA  
from swabs, tissue or suspension with the  
InviMag Virus DNA-RNA Kit/ KF96/ KFflex96

## [Plate Layouts]

### Binding plate

Plate type = KingFisher tub strip 1000µl  
Reagents:  
Name: Binding Solution  
Volume [µl]: 400  
Type: Reagent

Name: MAP A Solution  
Volume [µl]: 20  
Type: Reagent

Name: Lysed sample  
Volume [µl]: 400  
Type: Sample

### Washing plate\_1

Plate type = KingFisher tub strip 1000µl  
Reagents:  
Name: Wash Buffer R1  
Volume [µl]: 800  
Type: Reagent

### Washing plate\_2

Plate type = KingFisher tub strip 1000µl  
Reagents:  
Name: Wash Buffer R2  
Volume [µl]: 800  
Type: Reagent

### Washing plate\_3

Plate type = KingFisher tub strip 1000µl  
Reagents:  
Name: Wash Buffer R2  
Volume [µl]: 800  
Type: Reagent

### Elution plate

Plate type = KingFisher tub strip 1000µl  
Reagents:  
Name: Elution Buffer R  
Volume [µl]: 100  
Type: Reagent

## [Steps]

**Binding** (Plate: Virus DNA-RNA (A) –  
Binding)

Beginning of step:  
Precollect: No  
Release time [hh:mm:ss]: 00:00:10  
Release speed: Medium

Mixing/pause parameters:  
Pause for manual handling: No  
Mixing time [hh:mm:ss]: 00:05:00  
Mixing speed: Slow

End of step:  
Postmix: No  
Collect count: 4  
Collect time [s]: 3

### Washing\_1 (Virus DNA-RNA (B) - Wash1)

Beginning of step:  
Precollect: No  
Release time [hh:mm:ss]: 00:00:10  
Release speed: Fast

Mixing/pause parameters:  
Pause for manual handling: No  
Mixing time [hh:mm:ss]: 00:01:00  
Mixing speed: Medium

End of step:  
Postmix: No  
Collect count: 3  
Collect time [s]: 2

### Washing\_2 ((Virus DNA-RNA (C) – Wash2)

Beginning of step:  
Precollect: No  
Release time [hh:mm:ss]: 00:00:10  
Release speed: Fast

Mixing/pause parameters:  
Pause for manual handling: No  
Mixing time [hh:mm:ss]: 00:01:00  
Mixing speed: Medium

End of step:  
Postmix: No  
Collect count: 3  
Collect time [s]: 2

### Washing\_3 (Virus DNA-RNA (D) – Wash3)

Beginning of step:  
Precollect: No  
Release time [hh:mm:ss]: 00:00:10  
Release speed: Fast

Mixing/pause parameters:

Pause for manual handling: No

Mixing time [hh:mm:ss]: 00:01:00

Mixing speed: Medium

End of step:

Postmix: No

Collect count: 3

Collect time [s]: 2

---

**Drying** (Virus DNA-RNA (D) – Wash3)

Dry time [hh:mm:ss]: 00:08:00

Tip position: Outside well / tube

---

**Elution** (Virus DNA-RNA (E) – Elution)

Beginning of step:

Precollect: No

Release time [hh:mm:ss]: 00:00:10

Release speed: Medium

Mixing/pause parameters:

Pause for manual handling: No

Mixing time [hh:mm:ss]: 00:10:00

Mixing speed: Slow

End of step:

Postmix: No

Collect count: 4

Collect time [s]: 3

---

**Bead Removal** (Virus DNA-RNA (D) – Wash3)

Release time [hh:mm:ss]: 00:00:30

Release speed: Fast

---

## Troubleshooting

Problem	Probable cause	Comments and suggestions
<b>low amount of extracted DNA/RNA</b>	insufficient lysis	increase lyses time, but prevent too long lyses time because this also decrease yield reduce amount of starting material
	incomplete elution	take higher volume of <b>Elution Buffer D</b> , be sure you pipet the <b>Elution Buffer D</b> with the right amount to the right position
	low amount of MAP Solution A	mix <b>MAP Solution A</b> thoroughly before pipetting to the KingFisher tube
<b>low concentration of extracted DNA/RNA</b>	too much Elution Buffer	elute the DNA with lower volume of Elution Buffer D
	incorrect storage of starting material	ensure that the storage of starting material was correctly avoid thawing of the material
<b>degraded or sheared DNA/RNA</b>	incorrect storage of starting material	ensure that the storage of starting material was correctly avoid thawing of the material
	old material	ensure that the starting material is fresh or stored under appropriate condition (for long time storage at -20°C)! avoid thawing and freezing of the material old material often contains degraded DNA
<b>DNA/RNA does not perform well in downstream-applications (e.g. real-time PCR or PCR)</b>	ethanol carryover during elution	increase drying time for removing of ethanol
	salt carryover during elution	check up the <b>Wash Buffers</b> for salt precipitates. If there are any precipitates, solve these precipitates by careful warming ensure that the <b>Wash Buffers</b> are at room temperature
<b>low <math>A_{260}:A_{280}</math> ratio from UV measurement, eluted DNA is brown colored</b>	small part of the magnetic particles are left in the elution	centrifuge down at full speed for 1 min and transfer supernatant to a new tube

## Appendix

### KingFisher Software 3.1

The KingFisher Software 3.1 was used to create assay files for the KFmL, KF96 and KFlex96 instruments. The respective assay file can either be transferred onto the KingFisher workstation or be started directly from within the BindIt software. Keep in mind that directly run assay files are not stored in the workstation memory!

**Note:** When creating assay files for usage with KingFisher instruments in combination with Microtiter Deep Well plates (e.g. Thermo Electron), it is essential to use the KingFisher software 3.1 for assay development as this software version includes the correct adjustments for this plate. It is highly recommended to use Thermo Microtiter Deep Well plates with KF96 / KFlex96 workstations to ensure the best purification result.

### PC requirements for KingFisher Software 3.1

PC requirements	
Interface	Serial communication port via a RS-232 full duplex interface
Supported operating systems	Microsoft Windows 2000 Microsoft Windows XP Professional
Disk space	500 MB free disk space
Processor	Intel Pentium ≥ 700 MHz recommended
Memory	220 MB RAM recommended
Serial ports available	1
Pointing device	Mouse or equivalent is necessary
CD-ROM drive	1
Monitor / color settings	SVGA monitor with at least 1024 x 768 resolution and at least a 16-bit color environment
Service packs installed	Microsoft Windows 2000: Service Pack 4 (or greater) Microsoft Windows XP Professional: Service Pack 2 (or greater)
Browser	Microsoft Internet Explorer 6.0 (or greater) installed

If you do not have the correct Service Packs installed, you can download them from the Microsoft web pages: <http://www.microsoft.com/>

## **General notes on handling DNA**

### **Nature of DNA**

The length and delicate physical nature of DNA requires careful handling to avoid damage due to shearing and enzymatic degradation. Other conditions that affect the integrity and stability of DNA include acidic and alkaline environments, high temperature, and UV irradiation. Careful isolation and handling of high molecular weight DNA is necessary to ensure compatibility with various downstream applications. Damaged DNA could perform poorly in applications such as genomic Southern blotting, long-template PCR.

### **Storage of DNA**

A working stock of DNA can be stored at 2-8°C for several weeks. For long-term storage DNA should be stored at -20°C. However, storage at -20°C may cause shearing, particularly if the DNA is exposed to repeated freeze-thawing cycles.

Note that the solution in which the nucleic acid is eluted in will affect its stability during storage. Pure water lacks buffering capacity and an acidic pH may lead to acid hydrolysis. Tris or Tris-EDTA buffer contains sufficient buffering capacity to prevent acid hydrolysis.

### **Drying, dissolving and pipetting DNA**

Avoid overdrying genomic DNA after ethanol precipitation. It is better to air dry than to use a vacuum, although vacuum drying can be used with caution.

Avoid vigorous pipetting. Pipetting genomic DNA through small tip openings causes shearing or nicking. One way to decrease shearing of genomic DNA is to use special tips that have wide openings designed for pipetting genomic DNA.

### **DNA yield**

The amount of purified viral DNA depends on sample source, transport conditions, storage, and age of the sample.

## General notes on handling viral RNA

RNA is far less stable than DNA. It is very sensitive to degradation by endogenous RNases in the biological material and exogenous RNases which are permanently present everywhere in the lab. To achieve satisfactory qualitative and quantitative results in RNA preparations, contaminations with exogenous RNases has to be reduced as much as possible. Avoid handling bacterial cultures, cell cultures or other biological sources of RNases in the same lab where the RNA purification is to be carried out.

All glassware should be treated before use to ensure that it is RNase-free. Glassware should be cleaned with detergent, thoroughly rinsed and oven baked at 240°C for four or more hours before use. Autoclaving alone will not completely inactivate many RNases. Oven baking will both inactivate RNases and ensure that no other nucleic acids (such as Plasmid DNA) are present on the surface of the glassware. You can also clean glassware with 0.1% DEPC (diethyl pyrocarbonate). The glassware must stand 12 hours at 37°C and then be autoclaved or heated to 100°C for 15 min to remove residual DEPC.

- **Electrophoresis tanks** should be cleaned with detergent solution (e.g. 0.5% SDS), thoroughly rinsed with RNase-free water followed by ethanol and allowed to dry.
- **Non-disposable plastic ware** should be treated before use to ensure that it is RNase-free. Plastic ware should be thoroughly rinsed with 0.1 M NaOH, 1 mM EDTA followed by RNase-free water. Alternatively, chloroform-resistant plastic ware can be rinsed with chloroform to inactivate RNases.
- All **buffers** must be prepared from DEPC-treated, RNase-free ddH<sub>2</sub>O.
- When **working with chemicals**, always wear a suitable lab coat, disposable gloves, and protective goggles.
- Change gloves frequently and keep tubes closed.
- All centrifugation steps are carried out at room temperature.
- To avoid **cross-contaminations**, cavity seams shouldn't be moistened with fluid.
- Reduce the preparation time as much as possible.
- **Use only sterile, disposable polypropylene tubes** throughout the procedure. (These tubes are generally RNase free.)
- Keep isolated RNA on ice.
- Do not merge kit components from other kits unless the lot numbers are identical.
- To minimize the risk of infections from potentially infectious material, we recommend working under laminar air-flow until the samples are lysed.

This kit should only be used by personnel trained in *in-vitro* diagnostic laboratory practice.

## Storage of viral RNA

Purified viral RNA can be stored at -80°C and is stable for several years at this condition.

## Ordering information

Product	Package Size	Catalogue No.
InviMag® Virus DNA/RNA Mini Kit/ KFmL	15 preparations	2441150100
InviMag® Virus DNA/RNA Mini Kit/ KFmL	75 preparations	2441150200
InviMag® Virus DNA/RNA Mini Kit/ KFmL	300 preparations	2441150400
InviMag® Virus DNA/RNA Mini Kit/ KFmL w/o plastic	15 preparations	2441150150
InviMag® Virus DNA/RNA Mini Kit/ KFmL w/o plastic	75 preparations	2441150250
InviMag® Virus DNA/RNA Mini Kit/ KFmL w/o plastic	300 preparations	2441150450
<b>Single components for InviMag® Virus DNA/RNA Mini Kit</b>		
Extraction Tubes	60 ml	7440301500
MAP Solution A	1 ml	7440305100
Elution Buffer R	30 ml	7440304100
Wash Buffer R1 (add 20 ml ethanol)	60 ml	7440303500
Wash Buffer R2 (add 200 ml ethanol)	60 ml	7440303600

## Related products

RTP®DNA/RNA Virus Mini Kit	50 extractions	1040100200
RTP®DNA/RNA Virus Mini Kit	250 extractions	1040100300
InviMag® Virus DNA/RNA Mini Kit	50 extractions	1440100200
InviMag® Virus DNA/RNA Mini Kit	250 extractions	1440100300
InviMag® Virus DNA/RNA Mini Kit/KF96	1 x 96 preparations	7441050100
InviMag® Virus DNA/RNA Mini Kit/KF96	5 x 96 preparations	7441050200

## Ordering information (KingFisher mL and consumables)

Cat.no	Description
5400050	KingFisher mL, Magnetic Particle Processor, 100-240 V, 50/60 Hz
97002111	KingFisher mL tip comb, 800 pcs
97002121	KingFisher mL tube, 900 pcs (20x45 pcs)
97002131	KingFisher mL Combi 60 (tubes and tip combs for 60 samples)
97002141	KingFisher mL Combi 240 (tubes and tip combs for 240 samples)

## Possible suppliers for Isopropanol:

### Carl Roth

2-Propanol  
Rotipuran >99.7%, p.a., ACS, ISO  
Order no. 6752

### Applichem

2-Propanol für die Molekularbiologie  
Order no. A3928

### Sigma

2-Propanol  
Order no. 59304-1L-F



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